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STUDIES OF THE LIFE HISTORIES OF SOME QUEENSLAND BLATTIDAE (ORTHOPTERA).

Part 2. Some Native Species.

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(With 3 Text-figures and Plate I.)

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INTRODUCTION.

While engaged on a study of the domestic species of cockroaches common in Brisbane, interest was aroused in the numerous native species, none of which appear to have been studied previously. Some of these bred well in captivity, others proved less adaptable. Among the former were species of the genus *Methana* (subfamily Blattinae) and some species of *Ellipsidion*, and *Megamareta* (belonging to the subfamily Ectobiinae). Descriptions of the different stages and accounts of the life history of three species of *Methana*, two of *Ellipsidion* and one each of *Balta* and *Megamareta* are given. One new species of *Methana* is described.

A. THREE SPECIES OF METHANA STAL.

The three species of *Methana* studied were *M. curvigera* (Walk.), *M. marginalis* (Sauss.) and *M. caneae* n. sp.

Most species of *Methana* have fully developed tegmina and wings extending beyond the tip of the abdomen, but in several they are abbreviated. This genus has been recorded from Australia, New Guinea and Borneo, and is characterised by the supra-anal lamina in the male being quadrate, margins not serrate, and in the female triangular, apex emarginate ; pronotum anteriorly parabolic, posteriorly very obtusely angled ; posterior metatarsus about equal in length to remaining joints, biseriately spined beneath, its pulvillus apical ; remaining tarsal segments with large pulvilli, not spined beneath ; tarsal claws asymmetrical. The females have the typical blattine bivalvular type of subgenital plate and that of the male bears a pair of unsegmented styles. The cerci are long and acuminate.

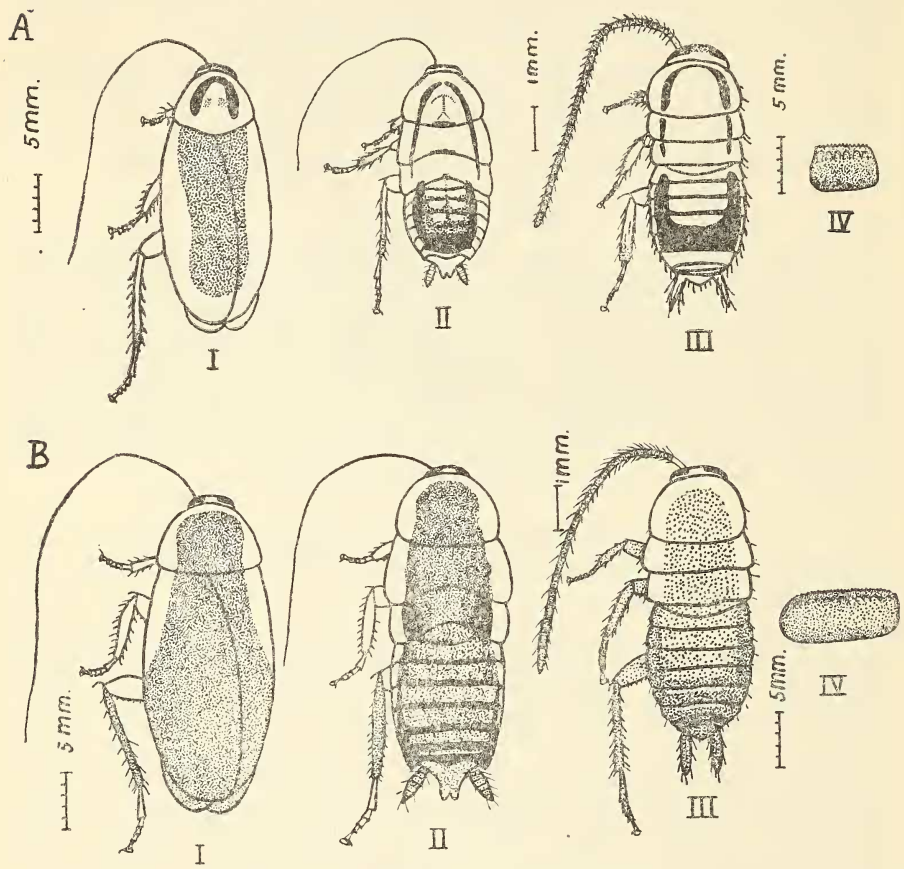
The favourite haunt of these species is under the loose bark of trees or logs. Many specimens of *curvigera* were found in wattle trees. In the strong sunlight they hid in curled up leaves. Their egg cases were found attached to the underside of loose bark or leaves.

In laboratory colonies they were easily bred. Leaves and pieces of bark were added to their rearing jars. They usually endeavoured to conceal their egg-capsules with sand, food particles, or minute pieces of chewed bark. Their regular diet was the same as that of the domestic species (Pope, 1953). All the native species were reared at room temperature.

1. METHANA CURVIGERA (Walker, 1868).

Tepper (1893) cites Walker's habitat of this species as Moreton Bay, Queensland. Specimens have been collected at Fraser Island and at Maryborough on the adjacent mainland.

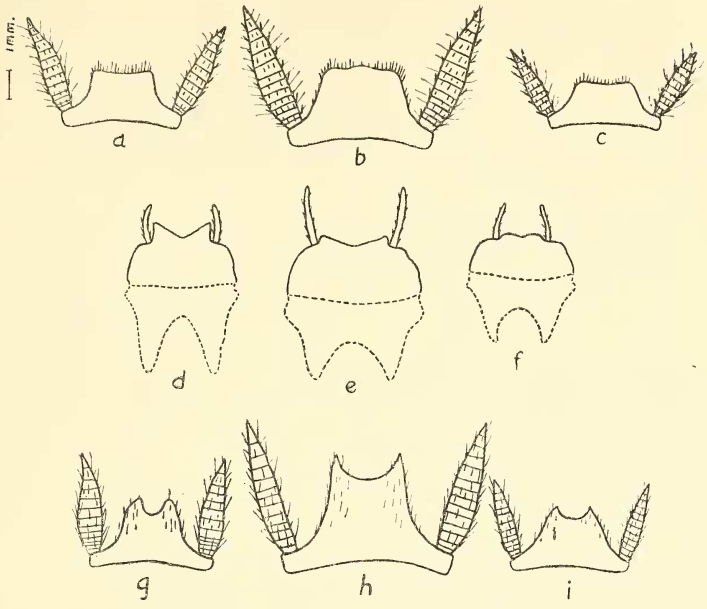
This pale species has quite distinctive markings in black and reddish-brown. The wide, pale or transparent margin around the whole insect is a striking feature of both adults and nymphs. It adapted itself very well to our laboratory conditions and was always very lively.



Text-fig. 1. A. *M. curvigera* (Walk.), B. *M. marginalis* (Sauss.). I, male adult; II, large nymph; III, newly hatched nymph (mounted specimen); IV, egg-capsule. Adults, large nymphs and egg-capsules are drawn to same scale. Newly hatched nymphs are greatly enlarged.

(a) Description of Stages.

ADULT (Text-fig. 1 AI). Head pale cream with dark, transverse interocular band on vertex and pale inconspicuous ocelliform spots; interocular width less than interantennal. Long, light brown antennae. Pronotum pale, translucent, with dark brown ∩-shaped band around lateral and anterior portions of disc, the band being sometimes interrupted in the mid line anteriorly. Left tegmen with wide colourless band along anterior margin to apex, remainder reddish-brown. Right tegmen similar except that the portion overlapped by the left tegmen is paler. Wings transparent except for white markings in the radial areas and a brownish suffusion basally over the branches of the median vein. Abdominal tergites pale, developing medium brown tinges and dark brown lateral marks towards



Text-fig. 2. Genital plates of three species of *Methana*. Male supra-anal : *a*, *curvigera* : *b*, *marginalis* : *c*, *caneae*. Male subgenital : *d*, *curvigera* : *e*, *marginalis* : *f*, *caneae*. Female supra-anal : *g*, *curvigera* : *h*, *marginalis* : *i*, *caneae*.

7th, which is sharply backwardly produced; 8th to 10th pale, last with small dark marks. Abdominal sternites reddish-brown darkening laterally, but extreme lateral margins pale. Legs pale, dark spines, slight darkening at tip of hind tibia, large arolia. Cerci pale yellowish-brown.

Total length :	♂	22-23 mm.,	♀	20-24 mm.
Tegmina length :	♂	17-18 mm.,	♀	16-18 mm.
Pronotum width :	♂	7·5-8·5 mm.,	♀	8-8·5 mm.

LARGE NYMPH (Text-fig. 1 AII). Thoracic tergites pale, almost transparent laterally, outline of body marked by brownish-black line. Posterior margins of pronotum and mesonotum dark brown, trace on metanotum. Pronotum narrowly edged with brown. Dorsum of abdomen with broad white lateral and posterior margins. Anterior tergites pale in centre, becoming reddish-brown then black sub-laterally and posteriorly. Abdominal sternites reddish-brown darkening laterally, but with extreme lateral margins white.

NEWLY HATCHED NYMPH (Text-fig. 1 AIII). Yellow head, dark vertex, black antennae. Yellow thoracic tergites, black line marking outline of body, translucent edges. First abdominal tergite yellow, 2nd to 6th dark laterally and posteriorly, the dark posterior band widening towards apex, remainder yellow. Abdominal sternites brownish-yellow. Tarsi and tibiae with slight apical darkening, arolia present. Body length : 3·5-4 mm. Antennae length : 6 mm.

EGG CAPSULE (Text-fig. 1 AIV). Orange, shiny, mediolateral brown dots (sometimes smudges) giving squared effect. Usually contains 12 eggs, range 8-14. Length : 6-7 mm. Depth : 4 mm.

(b) Life History.

(i.) THE INCUBATION PERIOD varied from about 5 weeks in midsummer to 8-9 weeks in midwinter.

(ii.) NYMPHAL DEVELOPMENT. Males usually appeared first in a colony, but sometimes males and females appeared simultaneously. The minimum period observed was 176 days. The results obtained in 5 colonies are set out in Table I.

TABLE I.
Duration of Nymphal Development of M. curvigera.

Colony Number.	Date of Hatching.	Duration (in Days) from Hatching to Appearance of Adult.		
		Male.	Female.	Final.
253	28 Mar.	246	259	266
297	27 May	181	228	228
317	21 June	176	203	203
310	27 June	193	190	—
316	7 July	180	180	235

(iii.) EGG-LAYING. Preoviposition periods from 14 to 29 days were recorded. One female kept with several males produced 16 egg-capsules at intervals of about 8 days. The female produced the egg-capsule with the serrated ridge dorsal, she usually carried it for one or two days and then fastened it to bark or concealed it in the food.

(iv.) LONGEVITY. The total life span of males ranged from 404 to 505 days, mean 451 days (7 observations). For females the range was 264 to 515 days, mean 419 days (8 observations).

2. METHANA MARGINALIS (Saussure, 1864).

This large, brown species with fully developed tegmina and wings in both sexes has a flavid margin on the anterior and lateral margins of the pronotum, extending to the radial margin of the tegmina.

Tepper (1893) gives Walker's habitat of this species as "Queensland, West Australia." It has been reported from North Queensland. Our specimens were taken in South Queensland. It has sometimes been reported as entering houses, but all our specimens were collected in the field.

(a) Description of Stages.

ADULT (Text-fig. 1 BI). Light coloured head, dark vertical marking on frons not joining dark transverse bar on vertex, interocular width considerably less than interantennal, white ocelliform spots, long brown antennae. Rich shiny reddish-brown pronotum and tegmina, white band around anterior and lateral edges of pronotum, white humeral streak on tegmina extending beyond the level of the anal area. That portion of right tegmen which is overlapped by the left is distinctly paler than the remainder. Anterior part of wings light brown, posterior part transparent with brown axillary veins. Abdominal tergites medium brown darkening laterally and posteriorly and towards apex of abdomen, 2nd to 4th with pale basal spots on the lateral margins, 3rd to 7th backwardly produced, most conspicuously so in 6th and 7th. Abdominal sternites dark reddish-brown, shiny, 1st to 3rd with pale lateral markings. Legs pale with brown

edges and spines. Hind tibiae brown. Cerci brown, considerably exceeding supra-anal lamina. The genital plates of both sexes are shown in text-fig. 2. Measurements of both sexes :—

Total length : 25-29 mm.
Tegmina length : 20-23 mm.
Pronotum width : 10-13 mm.

LARGE NYMPH (Text-fig. 1BII). Thoracic tergites reddish-brown with white lateral margins joining anteriorly on pronotum, blackish wing pads. Abdominal tergites reddish-brown with black posterior margins, 2nd to 7th backwardly produced, 2nd to 5th with light lateral edges; abdominal sternites light reddish-brown with pale markings laterally and very narrow dark posterior margins.

NEWLY HATCHED NYMPH (Text-fig. 1 BIII). Face dark brown, vertex yellow, orange antennal sockets, black antennae with paler bases. Light brown thoracic tergites with translucent edges and the dark outline of the body visible. Slightly darker brown abdominal tergites with lateral darkening, 6th to 7th with dark posterior margins. Abdominal sternites light brown with lateral darkening. Dark brownish-black legs with orange spines, large arolia. Cerci yellow at base, tip black. Total length : 4-5 mm. Antennae length: 7·5 mm.

EGG-CAPSULE (Text-fig. 1 BIV). Very large, dull orange brown colour at sides ; dark brown, flat base ; serrated ridge. Usually contains 26 eggs, range 24 to 30. Length : 11-13 mm. Depth : 4-5 mm.

(b) Life History.

(i.) THE INCUBATION PERIOD varied from about 5 weeks in midsummer to 8 weeks in midwinter. The number of nymphs derived from one egg-capsule varied from 12 to 26, average 18.

(ii.) NYMPHAL DEVELOPMENT seemed less affected by temperature than might be expected. Nymphs born in late summer and developing during winter reached maturity in approximately the same time as early summer nymphs. The results of observations on six colonies are set out in Table II.

TABLE II.
Duration of Nymphal Development in M. marginalis.

Colony Number.	Date of Hatching.	Duration (in Days) from Hatching to Adult.		
		Male.	Female.	Final.
237	8 Mar.	231	260	379
352	14 Nov.	256	239	274
358	17 Nov.	250	243	258
361	21 Nov.	183	246	294
372	12 Dec.	225	270	309
384	19 Dec.	221	241	—

(iii.) EGG-LAYING. The minimum preoviposition period observed was 10 days, but in most colonies it was much longer, ranging from 3 to 6 weeks. The female of a pair of adults, which were captured in the field, deposited 11 egg-capsules in 57 days, i.e. approximately one every 5 days. Observations on 2 isolated pairs were made. The females deposited 9 and 16 egg-capsules respectively, at intervals ranging from 5 to 14 days. A female usually carried her large egg-capsule for 1 to 2 days. It was usually fastened to bark and covered lightly with debris.

(iv.) LONGEVITY. Six males were observed to live from 339 to 473 days, mean 390 days ; five females lived from 275 to 589 days, mean 453 days. These figures refer to the total life-span, i.e. hatching until death.

3. METHANA CANEAE n. sp.

An undescribed species was found on Fraser Island, Queensland. Specimens were obtained from under loose bark on a dead, upright tree.

It differs from *marginalis* (Sauss.) in (a) its smaller size, (b) the abbreviated tegmina and wings, and (c) wider interocular space ; and from *parva* Shaw in (a) the flavid humeral streak extending beyond the level of the anal area, (b) the form of subgenital plate of the male, and (c) vertical band on frons not joining that on vertex. This species has been named in honour of Miss Helen Cane of the Division of Entomology, Commonwealth Scientific and Industrial Research Organisation, Canberra, who is at present working on a systematic review of Australian Blattidae and to whom we are indebted for assistance in identifying native species.

(a) DESCRIPTION OF STAGES.

ADULT (Plate I, fig. 1. b, c). Pale head, dark vertical bar on frons not joining dark transverse band on vertex, very inconspicuous ocelliform spots ; interocular width only slightly less than interantennal width and approximately twice ocular depth. Pronotum shiny, dark brown with a wide white band around the anterior and lateral margins and a very narrow dark line on extreme edge. Reddish-brown tegmina with pale humeral streak fading away just before it reaches the apex ; portion of right tegmen which is overlapped by left is distinctly paler than the remainder ; wings with anterior portion brown and posterior portion colourless with brown axillary veins ; tegmina and wings extending to 6th abdominal tergite. Abdominal tergites dark brown, 2nd to 5th with pale spots laterally, 2nd to 7th backwardly produced. Abdominal sternites reddish-brown darkening laterally and posteriorly. Dark cerci exceeding supra-anal lamina. Pale coxae with dark stripe, pale femora, brown tibiae, dark tarsi ; tarsal claws very asymmetrical. The genital plates of both sexes are shown in text-fig. 2.

Total length :	♂ 19-22 mm.,	♀ 20-24 mm.
Tegmina length :	♂ 11·5-13 mm.,	♀ 12·5-13 mm.
Pronotum width :	♂ 8-9 mm.,	♀ 8·5-9 mm.

LARGE NYMPH (Plate I, fig. 1a). Light brown head, brown band on front joining that on vertex, light brown antennae. Light, reddish-brown thoracic tergites with wide, translucent margins, which are narrowly edged with brown. First abdominal tergite reddish-brown, 2nd to 5th reddish-brown in centre, dark brown laterally, margins of 2nd to 5th pale, remaining segments dark brown. Abdominal sternites reddish-brown, small dark lateral dots. Pale coxae with dark streaks, tibiae light brown, darkening towards tarsi. Reddish-brown cerci.

NEWLY HATCHED NYMPH (Plate I, fig. 1e). Yellowish head, dark brown antennae. Yellow thoracic tergites, 2nd to 3rd with pale orange posterior margins. Abdominal tergites yellow with orange posterior margins, 6th with brown lateral dots. Orange abdominal sternites darkening very slightly laterally. Yellow coxae, legs darkening slightly from femora to tibiae, arolia present. Yellow cerci with dark tips. Total length : 3 mm. Antennae : 5 mm.

EGG-CAPSULE (Plate I, fig. 1d). Orange-yellow with irregular mediolateral brown markings, flat base giving squarish effect. Serrated ridge. Usually contains 22 eggs. Length : 9-10 mm. Depth : 4 mm.

DISTRIBUTION. Fraser Island, Queensland, (Feb.), type locality.

TAXONOMIC NOTES. Holotype male, allotype female, morphotype nymphs and egg-capsule, bred in laboratory from adults collected at Fraser Island, Q.; in collection of the Division of Entomology, C.S.I.R.O., Canberra.

(b) Life History.

(i.) THE INCUBATION PERIOD varied from 4½-5 weeks in midsummer to 7-8 weeks in winter. The number of nymphs hatching from one egg-capsule varied from 12 to 22, average 16.

(ii.) NYMPHAL DEVELOPMENT. The most rapid development occurred in a colony set up in early spring, adults of both sexes appearing by the 20th week. The results obtained from six colonies are set out in Table III.

TABLE III.

DURATION OF NYMPHAL DEVELOPMENT IN M. CANEAE.

Colony Number.	Date of Hatching.	Duration (in Days) from Hatching to Adult.		
		Male.	Female.	Final.
252	28 Mar.	200	200	205
270	11 Apr.	203	213	227
278	19 Apr.	224	202	—
284	22 Apr.	195	195	—
290	29 Apr.	188	200	—
325	25 Aug.	139	132	—

(iii.) EGG-LAYING. The preoviposition period varied from 12 to 26 days. The female usually carried the egg-capsule for 1-2 days and fastened it to bark. Two colonies containing 2 and 3 pairs were kept under observation. The former produced 69, the latter 79 egg-capsules. The period of reproductive activity lasted about one year. Egg-laying continued throughout the winter, though there was definite falling off in production in April, May and June. In each of these colonies females survived considerably longer than the males, and the last few egg-capsules produced were infertile.

(iv.) LONGEVITY. The total life-span of 5 males ranged from 344 to 568 days (mean 472 days), that of 5 females ranged from 562 to 702 days (mean 622 days).

B. SOME ECTOBIINE SPECIES.

The species belonging to the subfamily Ectobiinae which were studied were *Ellipsidion affine* Hebard, *E. australe* Sauss., *Balta scripta* (Shelford) and *Megamareta verticalis* Hebard. *E. affine* and *E. australe* were collected in trees near Brisbane, *B. scripta* on Fraser Island and near Brisbane, and *M. verticalis* at Gordonvale (North Queensland).

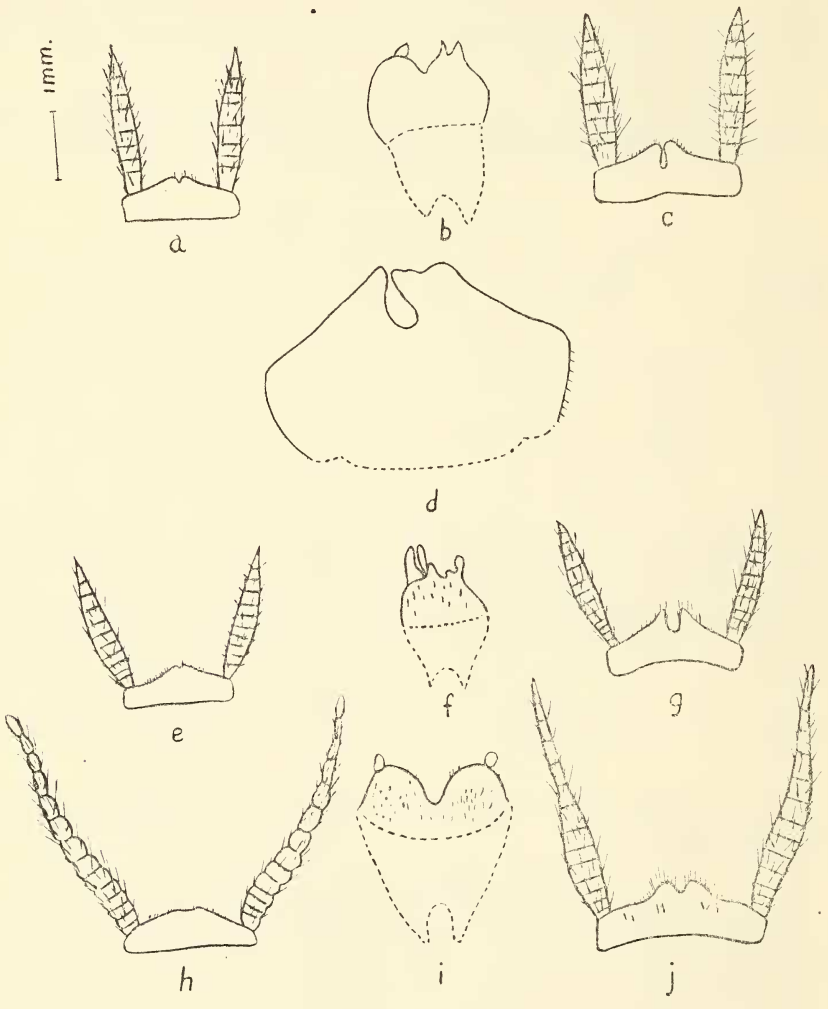
All these species have the following characters in common :—(i) female subgenital plate not of the valvular (blattine) type; (ii) anterior femora with antero-ventral margin lacking heavy spines before the row of piliform spines and with one or two terminal spines; (iii) median and posterior femora with ventral margins armed with spines; (iv) tarsal claws simple and decidedly asymmetrical.

In *Ellipsidion* and *Balta* the tegminal discoidal sectors are oblique, while in *Megamareta* they are longitudinal.

1. ELLIPSIDION AFFINE Hebard, 1943.

E. affine is a small species which has a black abdomen, the lateral and caudal margins of abdominal sternites being edged with white. These are the markings characteristic of the genus. Both sexes have fully developed tegmina and wings.

All the young hatching from one capsule were set up as one colony. This proved rather awkward because in a colony there often appeared a very great interval between the first moults to adult and the last.



Text-fig. 3. Genital plates. *Ellipsidion affine*: *a*, male supra-anal; *b*, male subgenital; *c*, female, supra-anal; *d*, female subgenital. *Balta scripta*: *e*, male supra-anal; *f*, male subgenital; *g*, female supra-anal. *Megamareta verticalis*: *h*, male supra-anal; *i*, male subgenital; *j*, female supra-anal.

(a) Description of Stages.

ADULT (Plate I, fig. 2 b). Black face, orange vertex, small pale orange ocelliform spots, black antennae with wider and very hairy basal half and orange distal half; interocular width greater than interantennal. Orange

pronotum with translucent margins, darker over body, sometimes with faint dark marks on pronotal disk. Orange tegmina with black bases and slightly black apices, exposed part with checkered effect; orange wings with wide, black border extending from apical to anal area. Some black thoracic sternal plates; abdominal sternites black, 3rd to 6th with definite white lateral and posterior margins, faintly marked on 2nd, 7th white laterally, 8th and 9th wholly black. Orange cerci with black bases, considerably exceeding supra-anal lamina. Black coxae with definite white stripe on posterior margin, orange legs, apical halves of femora black, tarsi dark (except for slight orange tinge on posterior metatarsus). The genital plates of both sexes are shown in text-fig. 3. Measurements for both sexes are :

Total length : 11-13·5 mm.
Tegmina length : 9·5-11·5 mm.
Pronotum width : 4·5-5 mm.

LARGE NYMPH (Plate I, fig. 2 a). Black pronotal disk bordered laterally with orange, white posterior margin, transparent lateral margin. Mesonotum and metanotum black with orange translucent lateral margins and white posterior margins. Abdominal tergites 1st and 2nd rounded, 3rd to 7th with postero-lateral angles backwardly produced; first five tergites with white dots on posterior margin and a transverse white line just anterior to the row of dots, 6th and 7th with posterior margin white and two median white dots; 8th and 9th black with white posterior margin; 10th wholly black. Some dark thoracic sternal plates; abdominal sternites black, 1st five with white lateral and posterior margins, 6th with white lateral margins. Black coxae with white stripe, orange trochanter, black femora with orange tinges, tibiae orange in centre, remainder black, dark tarsi, large arolia.

NEWLY HATCHED NYMPH. Dark brown head, translucent antennae darker at tips; interocular width greater than interantennal. Dark brown pronotum; golden brown mesonotum and metanotum; all thoracic tergites with translucent margins. Dark brown abdominal tergites. Medium brown abdominal sternites. Golden-brown cerci. Dark brown legs with transparent tarsi. Styles present in both sexes. Body length, 1·5-2 mm.; antennae length, 1·5 mm.; pronotum width, 1 mm.

EGG CAPSULE (Plate I, fig. 2c). Cream with brown medio-lateral dots, sometimes slightly darker below these; dark brown base. Contains 30-32 eggs. Length, 6 mm.; depth, 2·5 mm.

(b) Life History.

(i.) INCUBATION PERIOD. In the summer months the egg incubation period was usually 25 days while in the winter it was twice as long.

(ii.) PERIOD OF NYMPHAL DEVELOPMENT. As our series began in the middle of the summer season, the nymphs which did not reach maturity quickly had a very long nymphal period extended by the winter snap. The minimum period from hatching to the appearance of adults was 59 days, the majority, however, required 10 weeks to complete their development. Nymphs hatched in February did not become adult until August, average period 175 days. In most colonies there was a considerable lag between the appearance of the first and last adults, for three colonies for which records were kept, it varied from 5 to 35 weeks.

(iii.) COPULATION. Apparently daylight does not disturb this species very much, because the females could be seen depositing egg-cases, and pairs could be seen preparing to copulate and actually copulating. On several occasions the whole process was observed. The pair obviously appeared interested in each other, and rushed backwards and forwards frantically waving their antennae. The male walked around with his wings upright and his body arched so that the tip dragged over whatever he crawled on. At the same time the cerci pointed inwards and downwards together in the same plane as the abdomen. The male stood right in front of the female with the tip of his abdomen under her head. Then he poked his body under hers, and, as the female crawled on to his back, she appeared to wipe his tergites with her palps. When the tip of the male's abdomen reached that of the female he grasped her genitalia. Almost as soon as they contacted they swung round end-to-end in a flashing movement and then copulation took place. If the male failed to grasp the female, the pair would break away and start again. From the literature it appears that copulation in some cockroaches is a very speedy process. However, in the laboratory we have observed pairs of *E. affine in copulo* for periods as long as an hour. The female dragged the male in whatever direction she chose while the pair was in copulation.

This species copulated very frequently. A short observation on one pair is quite indicative.

Date.	Action of Pair.
6 XII. 48 ..	Pair copulating
13 XII. 48 ..	Female depositing
16 XII. 48 ..	Pair copulating
21 XII. 48 ..	Female depositing
22 XII. 48 ..	Pair copulating
23 XII. 48 ..	Female depositing
27 XII. 48 ..	Female depositing
1 I. 49 ..	Pair copulating
3 I. 49 ..	Female depositing
6 I. 49 ..	Female depositing

Five days after a pair matured they copulated, and 9 days after this the female was carrying an egg case. Actually in our colonies the pre-oviposition period varied from 14 to 30 days. The egg-capsule was produced with the serrated ridge dorsal, it was usually only carried for a day and then fastened on to a stem or the underside of a leaf.

(iv.) EGG-LAYING CAPACITY. The total egg-laying capacity was not determined, but one female laid 8 egg-capsules in 6 weeks, the average interval being 6 days, another laid 5 in 44 days. The egg-to-egg cycle is measured from the deposition of one capsule through until the nymphs hatching from it mature and deposit their first capsule. In the summer season it was as short as 113 days, while cycles in the winter season were extended to well over 200 days. It is possible for two generations of this species to be bred each year.

2. ELLIPSIDION AUSTRALE (Saussure, 1864).

This species has the characteristic markings of the genus i.e. black sternites edged with white. It is larger than *E. affine*, being about 19 mm. long and 6 mm. wide (at level of pronotum). The general colouration is a darker shade of orange and the black markings on the tegmina and wings are more pronounced. The pronotum is black with a yellow margin. It is an arboreal species like *E. affine*; and the nymphal stages of these two species are very similar. (Plate I, fig. 3 a-c).

Life History.

The incubation period varied from 3-4 weeks in midsummer to 6-7 weeks in midwinter. The number of eggs per egg-capsule was usually 32.

The nymphal period for nymphs hatching in early summer was about 18 weeks, those hatching in later summer required 32 weeks.

The preoviposition period was about 3 weeks. Females produced the egg-capsule with the serrated ridge dorsal and fastened it to bark or leaves, but did not attempt to conceal it. One female adult, collected in the field, laid 8 egg-capsules in 5 weeks, the average interval being 5 days.

Some insects were observed to live from 312 to 441 days, i.e. from hatching to death.

3. BALTA SCRIPTA (Shelford, 1911).

Balta scripta is a small, greyish-brown speckled cockroach. It was a very difficult species to handle in the laboratory. The adults were extremely lively, and the newly hatched nymphs very small and practically colourless. The small, light brown egg-cases were usually well concealed by the female either in the food, or sand in the bottom of the jar, and they were always extremely difficult to find.

(a) Description of Stages.

ADULT (Plate I, fig. 4 b). Light brown head; dark transverse interocular band with cream transverse band immediately below it, and another dark transverse band immediately below this again; interocular width less than interantennal; light brown antennae darkening towards tip. Pronotum light brown with transparent lateral margins and a symmetric design in dark brown lines and dots on the disk. Tegmina and wings fully developed in both sexes. Tegmina with checkered effect, transparent edge along lateral margin (when folded in repose). Wings with distal end of costal veins thickened. Abdomen light brown. Light brown cerci projecting considerably beyond supra-anal lamina. Pale yellowish-brown legs. The male subgenital plate is very asymmetrical (Text-fig. 3 f), that of the female simple, ample and slightly emarginate on the free margin. The supra-anal plates are shown in text-fig. 3 e, g.

Total length :	♂ 10·5 mm.,	♀ 9·5 mm.
Tegmina length :	♂ 9 mm.,	♀ 8 mm.
Pronotum width :	♂ 3·3 mm.,	♀ 3·3 mm.

LARGE NYMPH (Plate I, fig. 4 a). Pale head; dark transverse interocular band with pale transverse band below it and another dark transverse band below this, and then an interantennal transverse row of dots. Pronotum widest posteriorly, translucent lateral margins, pale pronotal disk with symmetric design in dark brown lines and dots. Thoracic and abdominal tergites pale, symmetrically marked with dark brown lines and dots. Abdominal sternites pale with dark brown markings. Cerci pale with dark brown marks, considerably exceeding supra-anal lamina. Pale legs, dark stripe at base of coxae, slight darkening at base of spines.

NEWLY HATCHED LARVA. Pale cream transparent head, body and appendages; large arolia. Total length : 1·3 mm. Pronotum width : 0·73 mm.

EGG CAPSULE (Plate I, fig. 4 c). Light brown, concolorous; length of serrated ridge greater than basal length. Usually contains about 16 eggs. Length: 3 mm. Depth: 2 mm.

(b) LIFE HISTORY.

The incubation period was 28-30 days for eggs laid in January and February. The nymphs emerging from a capsule in July (that is, about midwinter) matured 142-148 days later, while those emerging in February matured in 230 days. The longevity of two males was 219 and 231, while the intervals between their final moult and their death were 71 and 83 days. Another male lived 146 days as an adult. Two females which produced 7 and 8 egg capsules lived for 68 and 181 days respectively as adults. The longevity of the first female was 216 days from hatching.

4. MEGAMARETA VERTICALIS Hebard, 1943.

This is a relatively large, broad species (in comparison with other Ectobiinae), uniformly pale yellow in colour. It adapted itself quite easily to our laboratory conditions, and was probably the liveliest and most prolific of the ectobiine species we bred.

(a) DESCRIPTION OF STAGES.

ADULT (Plate I, fig. 5b). Pale yellow head and body. Interocular width less than interantennal; white ocelliform spots; pale antennae darkening slightly towards tip; darker brown vertical band on face, often expanding near ocelliform spots to become almost T-shaped; brown interocular band. Pronotum with transparent lateral margins. Tegmina with transparent humeral streak, wings with distal ends of costal veins slightly thickened. Pale cerci projecting considerably beyond supra-anal lamina. Legs uniformly pale yellow. The genital plates of both sexes (except the female subgenital, which is simple and ample) are shown in text-fig. 3 h-j. The measurements of both sexes are as follows:—

Total length:	13·5-15 mm.
Tegmina length:	12-13 mm.
Pronotum width:	5 mm.

LARGE NYMPH (Plate I, fig. 5 a). Pale yellow head and body. Thoracic tergites with broad transparent margins; all with two small brown dots posteriorly. Pale yellow abdomen; 1st to 5th abdominal tergites with row of small brown dots on posterior margin, 6th to 10th with small dark markings on lateral margins. Pale cerci with slightly dark bases, considerably exceeding supra-anal lamina. Pale, almost transparent legs.

NEWLY HATCHED NYMPH. Very pale head and body with almost transparent appendages. Very wide interocular space. Thoracic tergites each with two dots posteriorly. Mottled cerci. Large arolia. Total length: 2 mm.

EGG CAPSULE (Plate I, fig. 5 c). Very dark brown, smooth, not shiny, very narrow; compartments do not show up distinctly; wider at ridge than base; usually contains 30-36 eggs. Length, 6-7 mm.; depth, 3 mm.

(b) LIFE HISTORY.

During midsummer the incubation period ranged from 34 to 38 days, in early and late summer it covered 40 to 50 days and in midwinter 63 to 76 days.

Nymphs emerging in the early summer matured in 90 to 130 days.

The preoviposition period varied from 7 to 17 days. In a colony containing four females kept under observation for 9 months over 70 egg-capsules were produced. The female of the original pair was already an adult of unknown age when our laboratory series began. She produced 10 egg-capsules in 84 days, at intervals ranging from 3 to 22 days. In the gravid female the abdomen became distinctly green just before she produced an egg-capsule.

The total life-span ranged from 257 to 408 days, mean 344 days, for 11 males ; and 265 to 424 days, mean 350 days, for 14 females.

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SUMMARY.

One new species, *Methana caneae* n. sp. is described together with its life-history. Brief descriptions and life-histories are given of *Methana curvigera* (Walk.), *M. marginalis* Stal, *Ellipsidion affine* Hebard, *E. australe* (Sauss.), *Balta scripta* (Shelford) and *Megamareta verticalis* Hebard.

The periods observed for egg incubation, nymphal development and maximum life span respectively are as follows :—

M. curvigera :	5 to 9 weeks ; 25 to 38 weeks ; 515 days.
M. marginalis :	5 to 8 weeks ; 26 to 44 weeks ; 589 days.
M. caneae :	4½ to 8 weeks ; 19 to 32 weeks ; 702 days.
E. affine :	3½ to 7 weeks ; 8½ to 45 weeks ; 315 days.
E. australe :	3 to 7 weeks ; 18 to 32 weeks ; 441 days.
B. scripta :	4 weeks (summer) ; 20 to 33 weeks ; 230 days.
M. verticalis :	5 to 11 weeks ; 13 weeks (summer) ; 424 days.

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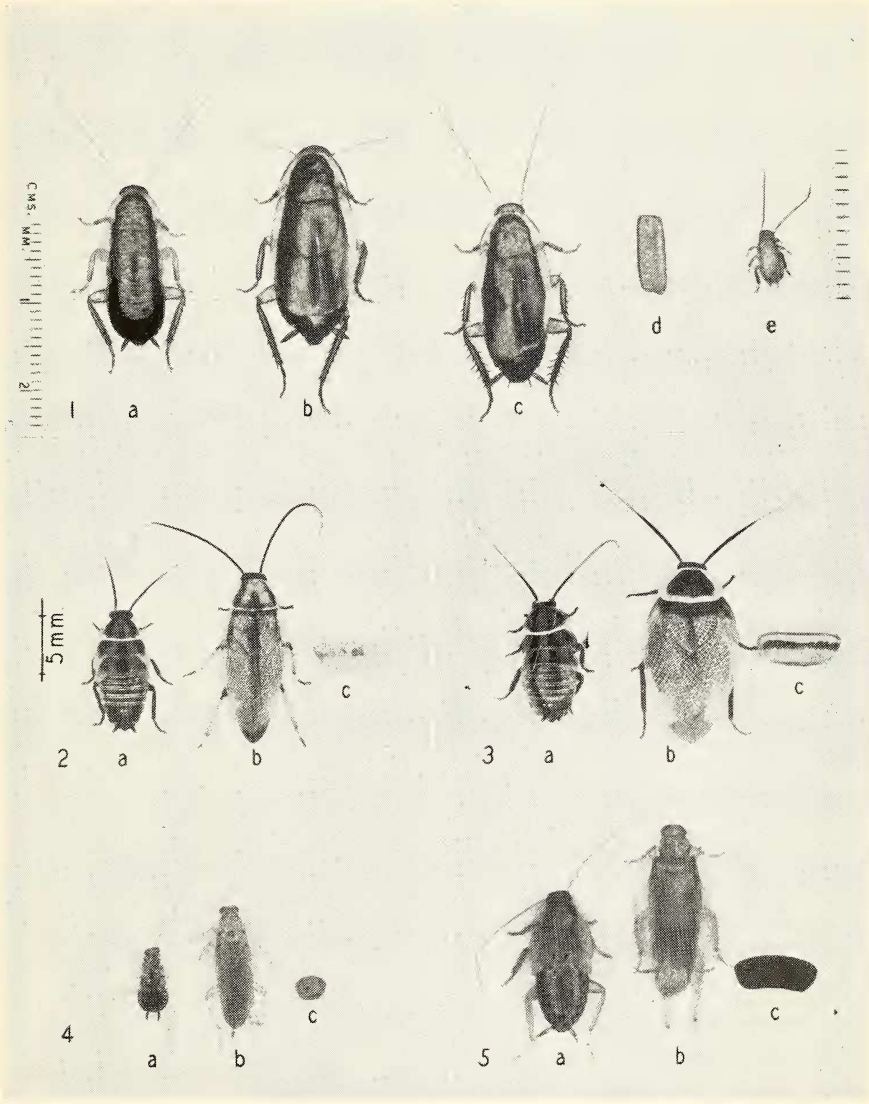
EXPLANATION OF PLATE I.

FIG. 1. *Methana caneae* : a, large nymph ; b, female adult ; c, male adult ; d, egg-capsule; e, newly hatched nymph. Fig. 2. *Ellipsidion affine*. Fig. 3, *E. australe*. Fig. 4. *Balta scripta*. Fig. 5. *Megamareta verticalis* : a, large nymph ; b, adult ; c, egg-capsule. Figs. 1 a-d are to same scale ; scale beside 1 e is in mm. ; figs. 2-5 are to the same scale.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